MA 15400, Fall 2009
EXAM 2
Form B

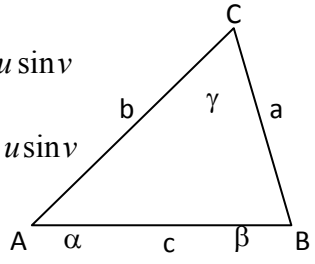
Answers are on the last page.

$\sin^2\theta + \cos^2\theta = 1$ $\quad 1 + \tan^2\theta = \sec^2\theta$ $\quad 1 + \cot^2\theta = \csc^2\theta$

$\sin(u+v) = \sin u\cos v + \cos u\sin v$ $\quad \sin(u-v) = \sin u\cos v - \cos u\sin v$

$\cos(u+v) = \cos u\cos v - \sin u\sin v$ $\quad \cos(u-v) = \cos u\cos v + \sin u\sin v$

$\tan(u+v) = \dfrac{\tan u + \tan v}{1 - \tan u\tan v}$ $\quad \tan(u-v) = \dfrac{\tan u - \tan v}{1 + \tan u\tan v}$



$\sin(2u) = 2\sin u\cos u$ $\quad \cos(2u) = \cos^2 u - \sin^2 u$ $\quad \tan(2u) = \dfrac{2\tan u}{1 - \tan^2 u}$

1. A 27 foot ladder leans against the side of a 100 foot tall building. The angle between the ladder and the building is $25°$. If the **bottom** of the ladder is then moved **2 feet closer** to the building, to the nearest tenth of a degree, what is the angle that the ladder now makes with the side of the building?

A. $20.4°$

B. $29.8°$

C. $22.8°$

D. $18.1°$

E. None of the above

2. Express as a trigonometric function of one angle.

$$\sin 43° \cos 17° + \cos 43° \sin 17°$$

A. $\cos 26°$

B. $\sin 60°$

C. $\cos 60°$

D. $\sin 26°$

E. None of the above

3. Given ΔABC with $\gamma = 90°$, express side *b* in terms of angle α and side *a*.

A. $b = a \sin \alpha$

B. $b = a \tan \alpha$

C. $b = a \cot \alpha$

D. $b = a \cos \alpha$

E. $b = a \sec \alpha$

Questions 4 and 5: An airplane is traveling at 350 miles per hour for 3 hours in the directions 120° and then flies in the direction 210° for 1 hour.

4. To the nearest mile, how far is the plan from its starting point?

A. 894 miles

B. 791 miles

C. 783 miles

D. 1107 miles

E. None of the above

5. To the nearest degree, in what direction does the plan need to fly in order to get back to the start point?

A. 312°

B. 328°

C. 318°

D. 288°

E. None of the above

6. Find all solutions of the equation using *n* as an arbitrary integer.

$$\tan\left(3x-\frac{\pi}{4}\right)=1$$

A. $x=\frac{7\pi}{36}+\frac{\pi}{3}n$

B. $x=\frac{\pi}{3}+\frac{\pi}{3}n$

C. $x=\frac{5\pi}{36}+\frac{\pi}{3}n$

D. $x=\frac{\pi}{4}+\frac{\pi}{4}n$

E. $x=\frac{\pi}{6}+\frac{\pi}{3}n$

7. Find the exact solutions of the equation that are in the interval $[0,2\pi)$.

$$2\cos^2 t-3\cos t+1=0$$

A. $t=\frac{\pi}{6},\frac{11\pi}{6},0$

B. $t=\frac{2\pi}{3},\frac{4\pi}{3},\pi$

C. $t=\frac{5\pi}{6},\frac{7\pi}{6},\pi$

D. $t=\frac{\pi}{3},\frac{5\pi}{3},0$

E. None of the above

8. If α and β are second-quadrant angles such that $\tan\alpha = \frac{-3}{4}$, and $\sec\beta = -6$, find $\cos(\alpha+\beta)$.

A. $\frac{3-4\sqrt{35}}{30}$

B. $\frac{4+3\sqrt{35}}{30}$

C. $\frac{3+4\sqrt{35}}{30}$

D. $\frac{4-3\sqrt{35}}{30}$

E. None of the above

9. Find the exact value of $\tan(2\theta)$ if $\cos\theta = \frac{-8}{\sqrt{113}}; 180° < \theta < 270°$.

A. $\frac{15}{113}$

B. $\frac{112}{15}$

C. $\frac{-15}{113}$

D. $\frac{-112}{15}$

E. None of the above

10. Find the solutions of the equation that are in the interval $[0, 2\pi)$.

$$\sin(2t) + \sin(t) = 0$$

A. $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}$

B. $0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$

C. $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{11\pi}{6}$

D. $0, \pi, \frac{2\pi}{3}, \frac{4\pi}{3}$

E. None of the above

11. Find the exact value of the expression whenever it is defined.

$$\cos^{-1}\left(\cos\frac{4\pi}{3}\right)$$

A. $\frac{2\pi}{3}$

B. $\frac{5\pi}{3}$

C. $\frac{-\pi}{3}$

D. $\frac{4\pi}{3}$

E. None of the above

12. Which of the following is equivalent to $\sin\left(\theta+\frac{3\pi}{2}\right)$? (There are only four choices)

A. $\sin\theta$

B. $-\sin\theta$

C. $\cos\theta$

D. $-\cos\theta$

13. Find the equivalent algebraic expression in *x* for *x*> 0.

$$\sin\left(2\tan^{-1}\left(5x\right)\right)$$

A. $\frac{10x}{25x^2+1}$

B. $\frac{1-25x^2}{25x^2+10x+1}$

C. $\frac{1-25x^2}{25x^2+1}$

D. $\frac{10x}{25x^2+10x+1}$

E. None of the above

14. Think about the graph of $y = 2\cos^{-1}\left(\frac{1}{3}x\right)$. Are you thinking? You might want to sketch it.

Which of the following is true about the graph?
(Hint: Domains refers to the possible values of x and range the possible values of *y*)

A. Domain is $\left[\frac{-1}{3},\frac{1}{3}\right]$, Range is $[0,2\pi]$

B. Domain is $[-3,3]$, Range is $\left[0,\frac{\pi}{2}\right]$

C. Domain is $[-3,3]$, Range is $[0,2\pi]$

D. Domain is $\left[\frac{-1}{3},\frac{1}{3}\right]$, Range is $\left[0,\frac{\pi}{2}\right]$

E. None of the above

15. Approximate the solutions to four decimal places in the interval $\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$.

$$2\tan^2 x - 3\tan x - 9 = 0$$

A. $2.1588, -1.8925$

B. $1.2490, -0.9828$

C. $1.4439, -0.2618$

D. $1.1903, -0.7854$

E. None of the above

Exam 2 Answers

Question	Form B - Orange	
1.	A	$20.4°$
2.	B	$\sin 60°$
3.	C	$b = a\cot\alpha$
4.	D	1107 miles
5.	C	$318°$
6.	E	$x = \frac{\pi}{6} + \frac{\pi}{3}n$
7.	D	$t = \frac{\pi}{3}, \frac{5\pi}{3}, 0$
8.	D	$\frac{4-3\sqrt{35}}{30}$
9.	B	$\frac{112}{15}$
10.	D	$0, \pi, \frac{2\pi}{3}, \frac{4\pi}{3}$
11.	A	$\frac{2\pi}{3}$
12.	D	$-\cos\theta$
13.	A	$\frac{10x}{25x^2+1}$
14.	C	Range is $[0, 2\pi]$, Domain is $[-3, 3]$
15.	B	$1.2490, -0.9828$